

What is claimed is:

1. A high-pressure treatment apparatus, comprising:
- a first solid reservoir;
 - a second solid reservoir connected to the first solid
 - 5 reservoir through a first connecting pipe;
 - a high-pressure reactor connected to the second solid reservoir through a second connecting pipe;
 - means for feeding reaction medium into the high-pressure reactor;
 - 10 a first sealing unit and a second sealing unit that are intervened in the first connecting pipe and the second connecting pipe, respectively;
 - a first fluid feed unit for feeding a first fluid between the first sealing unit and the second sealing unit;
 - 15 a second fluid feed unit for feeding a second fluid between the second sealing unit and the high-pressure reactor; and
 - means for opening the second sealing unit during shut-off of the first sealing unit and controlling the first fluid
 - 20 and the second fluid so that pressure between the first sealing unit and the second sealing unit and pressure between the second sealing unit and high-pressure reactor decrease toward the high-pressure reactor to establish a pressure gradient.
 - 25 2. The high-pressure treatment apparatus as set forth in claim 1, wherein the means for controlling to establish the pressure gradient comprises:
 - a first pressure adjustment unit for adjusting pressure

of the first fluid;

a first flow rate adjustment unit for adjusting a feed amount of the first fluid;

a second pressure adjustment unit for adjusting pressure
5 of the second fluid; and

a second flow rate adjustment unit for adjusting a feed amount of the second fluid.

3. The high-pressure treatment apparatus as set forth in claim 1, wherein the volume of the second solid reservoir
10 is smaller than that of the first reservoir.

4. The high-pressure treatment apparatus as set forth in claim 1, wherein the second solid reservoir has a pressure relief valve.

5. The high-pressure treatment apparatus as set forth
15 in claim 1, wherein all of the first connecting pipe, the second solid reservoir, the second connecting pipe, the second sealing unit and the high-pressure reactor downstream from the first sealing unit are pressure-resistant.

6. The high-pressure treatment apparatus as set forth
20 in claim 1, wherein solid is transferred from the second solid reservoir to the high-pressure reactor by gravity.

7. The high-pressure treatment apparatus as set forth in claim 1, wherein at least one of the first solid reservoir and the second solid reservoir is provided with a vibrating
25 means.

8. The high-pressure treatment apparatus as set forth in claim 1, wherein cooling means is installed between the second sealing unit and the high-pressure reactor.

9. The high-pressure treatment apparatus as set forth in claim 1, wherein a ball valve is used in at least one of the first sealing unit and the second sealing unit.


10. The high-pressure treatment apparatus as set forth
5 in claim 1, wherein at least one of between the first solid reservoir and the second solid reservoir and between the second solid reservoir and the high-pressure reactor, a rotary feeder is installed.

11. The high-pressure treatment apparatus as set forth
10 in claim 1, wherein a primary crushing means for implementing primary crushing of solid fed to the first solid reservoir is provided with.

12. The high-pressure treatment apparatus as set forth
15 in claim 1, wherein between the first solid reservoir and the high-pressure reactor, means for measuring feed speed of the solid is installed.

13. The high-pressure treatment apparatus as set forth in claim 1, wherein between the second solid reservoir and the high-pressure reactor a screw feeder is installed.

20 14. The high-pressure treatment apparatus as set forth in claim 1, wherein between the second solid reservoir and the high-pressure reactor a vibration feeder is installed.

 25 15. A high-pressure treatment apparatus, comprising:
a high-pressure reactor;
an exterior vessel in which the high-pressure reactor is installed;
means for feeding a treatment object into the high-pressure reactor;

means for feeding a reaction medium into the high-pressure reactor; and

means for controlling pressure within a gap between the exterior vessel and the high-pressure reactor to be higher
5 than that within the high-pressure reactor.

16. The high-pressure treatment apparatus as set forth in claim 15,

wherein the means for controlling pressure within a gap comprises a feeder of pressure holding fluid into the gap
10 and a pressure controller for controlling pressure of the pressure holding fluid.

17. The high-pressure treatment apparatus as set forth in claim 15, further comprising a means for controlling temperature of the exterior vessel to be lower than that of
15 the high-pressure reactor.

18. The high-pressure treatment apparatus as set forth in claim 15, wherein the exterior vessel is consisting of a trunk portion and a cover portion that can be opened and shut and the high-pressure reactor is fixed to be removable to the
20 exterior vessel.

19. The high-pressure treatment apparatus as set forth in claim 15, wherein the high-pressure reactor is formed of at least one selected from the group consisting of austenite stainless steel, Ni, Zr, Ti, Ta, Au, Pt, alloys of two kinds
25 or more thereof, and alloys of at least one kind thereof.

20. The high-pressure treatment apparatus as set forth in claim 15, wherein an inner surface of the high-pressure reactor is lined with at least one selected from the group

consisting of austenite stainless steel, Ni, Zr, Ti, Ta, Au, Pt, alloys of two kinds or more thereof, and alloys of at least one kind thereof.

21. The high-pressure treatment apparatus as set forth
5 in claim 15, wherein an inner surface of the high-pressure reactor is coated by ceramic material by thermally spraying.

22. The high-pressure treatment apparatus as set forth
10 in claim 1, wherein the high-pressure reactor is installed inside of an exterior vessel, and gap pressure control means for controlling pressure inside of the gap of the high-pressure reactor and the exterior vessel to be higher than that inside of the high-pressure reactor.

23. The high-pressure treatment apparatus as set forth
15 in claim 1, wherein the reaction medium feeding into the high-pressure reactor is in a super-critical or sub-critical state.

24. A method for feeding a treatment object to a high-pressure treatment apparatus, comprising the steps of:

20 feeding a solid treatment object from a first solid reservoir to a second solid reservoir under atmospheric pressure;

~~feeding the solid treatment object from the second~~
solid reservoir to a high-pressure reactor;

25 intervening a first sealing unit between the first solid reservoir and the second solid reservoir;

intervening a second sealing unit between the second solid reservoir and the high-pressure reactor; and

closing the first sealing unit and opening the second

sealing unit to form a pressure gradient so that pressure between the first sealing unit and the second sealing unit and pressure between the second sealing unit and the high-pressure reactor decrease toward the high-pressure reactor.

5 25. A method for protecting a high-pressure treatment apparatus, comprising the steps of:

 filling a pressure holding fluid into a gap between a high-pressure reactor and an exterior vessel in which the high-pressure reactor is installed;

10 pressurizing the pressure holding fluid to maintain pressure within the gap higher than that inside of the high-pressure reactor; and

 controlling temperature and movement of the pressure holding fluid to maintain the temperature of the exterior
15 vessel lower than that of the high-pressure reactor.